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CHEMICAL SYSTEMS LABORATORY TECHNICAL REPORT

ARCSL-SP-82005

**INSTALLATION OF SUBSTITUTE E45R2 (4800 CFM)
GAS-PARTICULATE FILTERS IN LABORATORY VENTILATION SYSTEMS**

by

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Physical Protection Division

August 1982

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**US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010**



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Two E45R2 Gas Particulate Filter Units (2400 cfm each) were successfully recovered from E-1 Nike Hercules Collective Protection Systems, modified into a 4800 cfm filter system and installed in a laboratory ventilation system.		

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PREFACE

The work described in this report was authorized and funded under Project 575414(4932), Pollution Abatement. This project was begun in November 1979 and completed in December 1979.

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INSTALLATION OF SUBSTITUTE E45R2 (4800 CFM) GAS-PARTICULATE FILTERS IN LABORATORY VENTILATION SYSTEMS

1. INTRODUCTION

Chemical Systems Laboratory (CSL) uses gas-particulate filters to scrub the effluent from chemical laboratory fume hood air ventilation systems and toxic materials work areas to assure that hazardous chemicals are not released into the atmosphere. The gas-particulate filters are rated for flow capacities up to 5,000 cubic feet per minute (cfm). Because of a problem in normal production of these filters as well as delivery delays, an alternative was suggested to use existing surplus filter units, modify them as necessary and install them in the air ventilation system.

2. EXPERIMENTAL PROCEDURE

Surplus gas particulate filter units removed from trailer-mounted Nike-Hercules Collective Protective Systems were used for the installation. The filter units are designated as E45R2, each with a volumetric capacity of 2400 cubic feet per minute. The fabrication of a 4800 cubic foot per minute filter unit is described in ARCSL Technical Report 80006 dated March 1980.

Two of the E45R2 filter units were removed from their trailer mounted positions, modified by removal of excess material and joined together in parallel to provide the required 4800 cfm capacity.

The filter units were installed in an existing ventilation system in building E3300 in the CSL Research Division to demonstrate that surplus filter units could be used to meet urgent requirements for gas-particulate filter units.

Figure 1 illustrates an overall view of the installed filter unit on the roof of building E3300. The unit was connected to the existing motor-blower exhaust system with flexible hoses, which were spare parts from the original Nike-Hercules system and were used as a field expedient for the installation. The flexible hoses are butyl-covered cloth with serpentine rings to prevent collapse (see figure 2).

The inlet side of the filter was connected to the laboratory duct work with light gage sheet metal ducts and transition pieces (figures 3 and 4).

The E46 filter cells (figure 5) were replaced with cells obtained from surplus stock then were packaged and packed in level A vapor-proof barrier bags and cartons. Before installation of the filter units, statistical sampling and testing of the E46 filter cells was performed using Freon® for leak and dimethyl methyl phosphonate (DMMP) for gas life on the two available lots of cells.

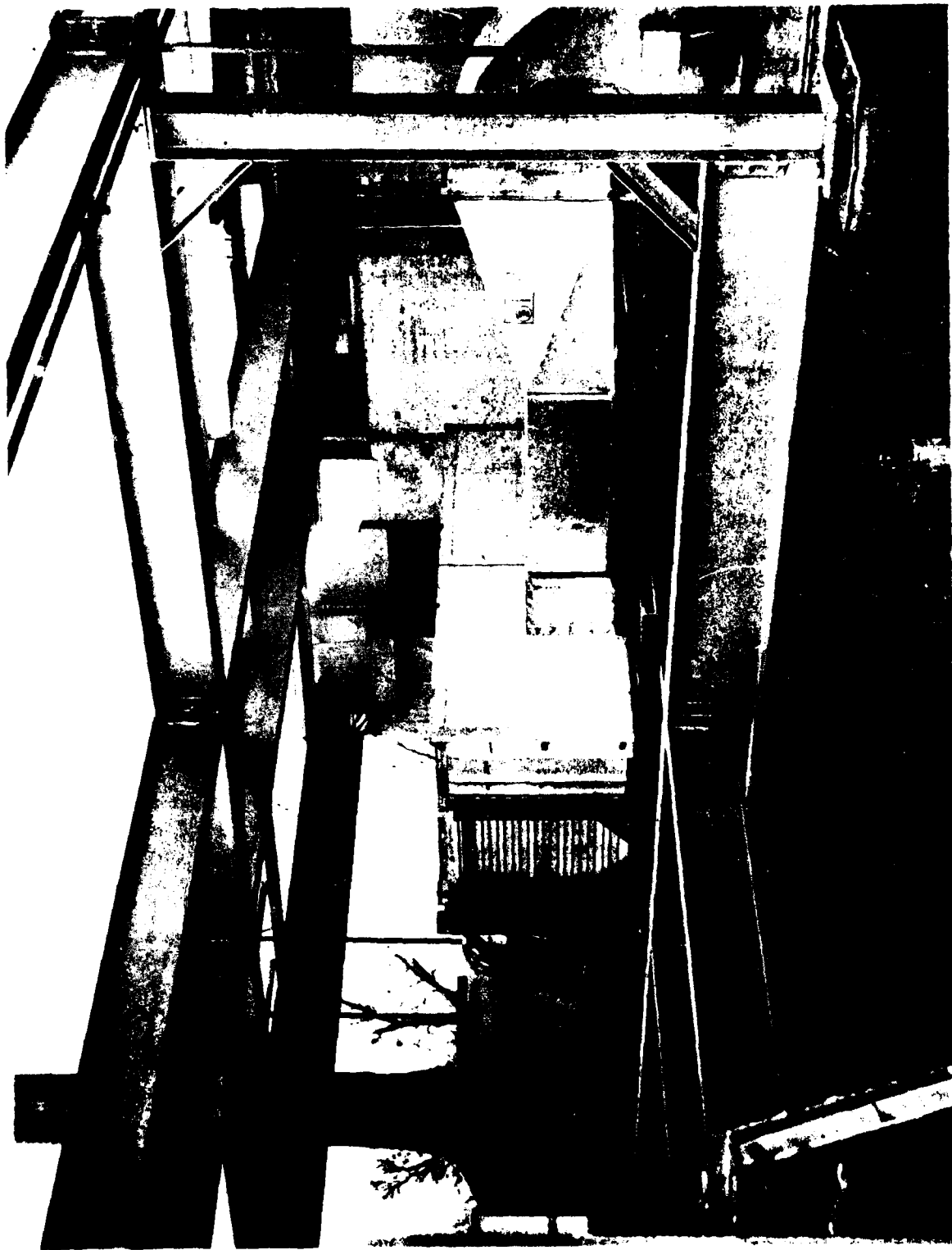


Figure 1. E45R2 Gas Particulate Filter Units Installed in Laboratory Ventilation System



Figure 2. Detail of Field Expedient Flexible Ducts on Effluent Side



Figure 3. Overall View of Influent Side

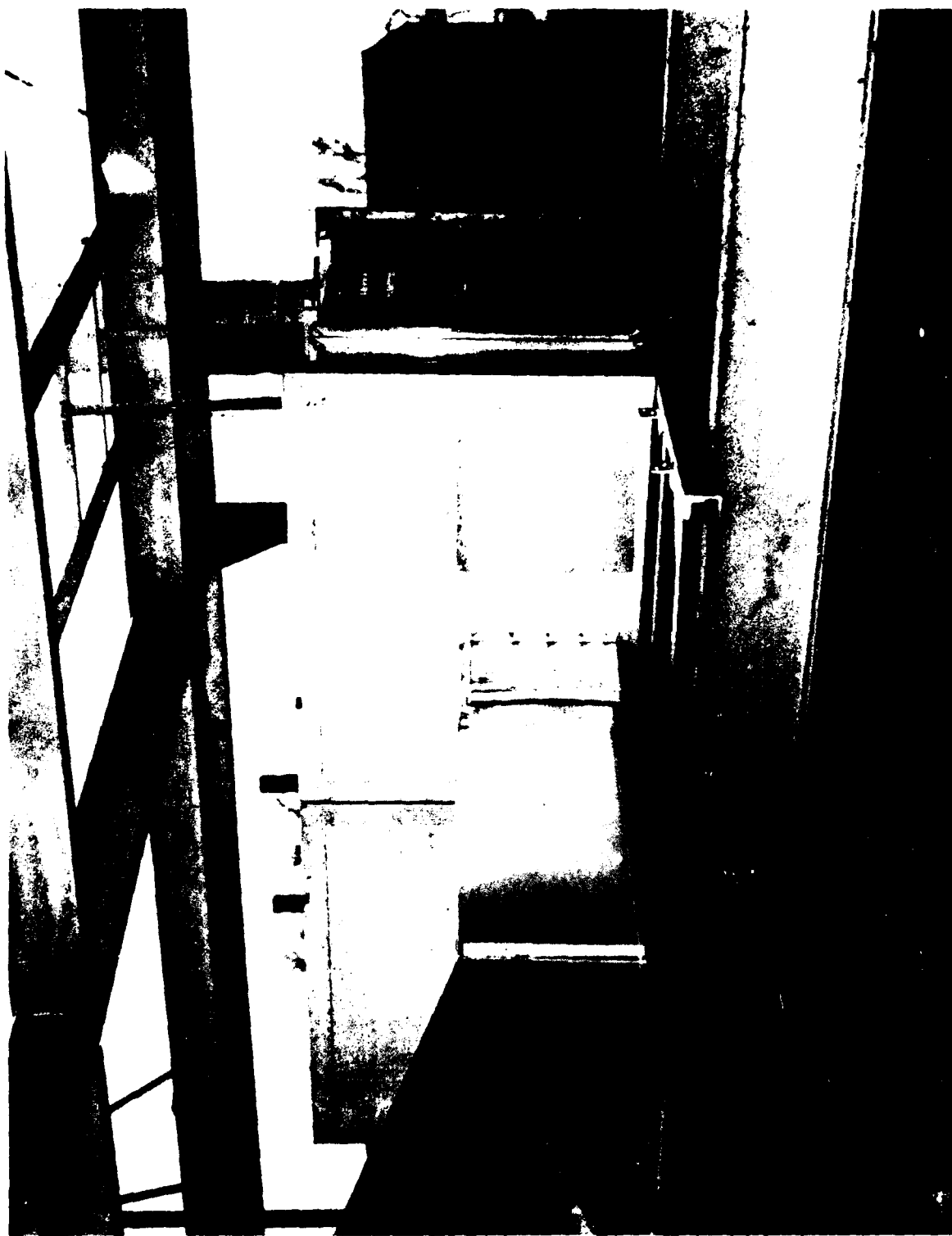


Figure 4. Detail of Metal Transition Pieces on Influent Side

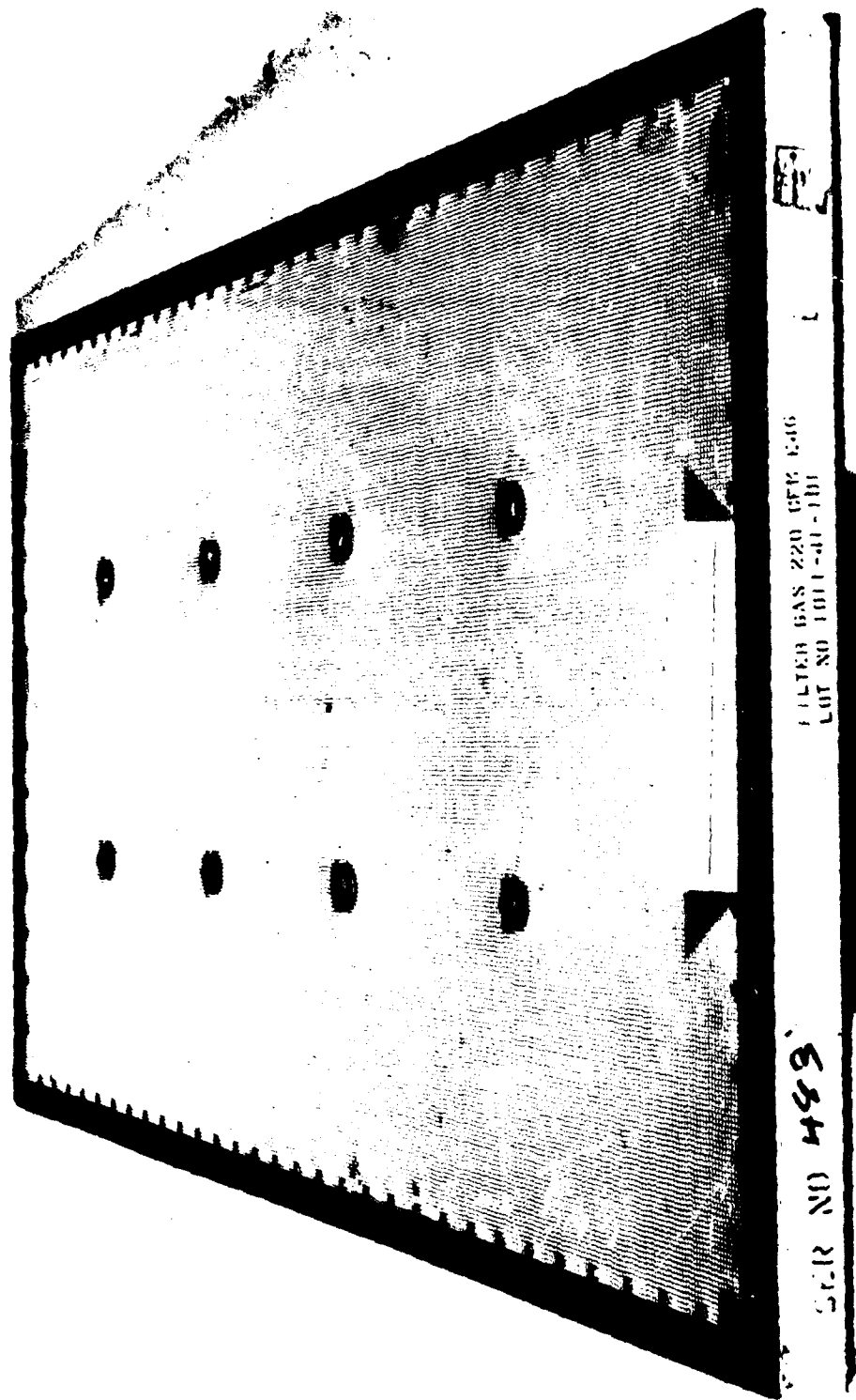


Figure 5. E46 Gas Adsorbing Filter Cell, a Component Part of E45R2 Gas Particulate Filter Units

3. RESULTS

Two E45R2 2400 cfm filters were successfully modified and installed in a laboratory fume hood air ventilation system to provide for 4800 cfm of gas-absorbing filtering capacity.

4. DISCUSSION

Gas-absorbing filters in nominal volume flow capacities of 5000 cfm cost approximately \$10,000 each when fabricated to military specification.

Because procurement of filters of this capacity was behind delivery schedule, an alternative method was sought to provide an urgent replacement for a gas filter for the laboratory.

A diligent search for filters resulted in discovery of the surplus E-1 Nike-Hercules collective protective units at the Tobyhanna Army Depot, Pennsylvania. Working through the Nike-Hercules Item Manager at Troop Support and Readiness Command (TSARCOM) the entire assets of 48 each trailer-mounted surplus filters were obtained and shipped to CSL costing about \$17,000. The units were dismantled from their trailer mount, stripped of excess equipment and modified for the total volumetric capacity in CSL's Developmental Support Division, Experimental Fabrication Branch. The recovery of the parts is documented in ARCSL-SP-81016. The modification cost was approximately \$3,000.

The Facilities Engineering Division, Aberdeen Proving Ground installed the filter unit on the roof of the building under the host-tenant agreement.

The ARRADCOM Product Assurance Division sampled and tested E46 filter cells.

5. CONCLUSIONS

a. Surplus gas-particulate filter units can be modified and installed in fume hood air ventilation systems to provide for contaminant removal in the effluent air systems.

b. Cost savings result from using surplus filters for urgent or special requirements.

Surplus Filters

Cost of 48 Trailer-Mounted E45R2 filter units - 0 (Sunk costs)

Transportation	$\frac{\$17,000}{48}$	=	\$354
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Modification			\$3,000
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Cost of Recovered Filter			3,354 each
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Savings

Procurement of New 5000 cfm Filter Unit	\$10,000
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Less Cost of Recovered Filter	-3,354
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Cost Savings of One Unit	\$6,646
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Potential Savings

48 units x \$6,646 Savings	=	\$319,008
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c. The E46 filter cells, manufactured by Edgewood Arsenal in 1969, have retained excellent gas-lives in their packaged and packed configuration.

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